Clear-Com | IP-Transceiver Ubiquiti Transport

Version 2

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1 Goal

Remotely connect a FreeSpeak II IP-Transceiver (IPT) using Ubiquiti AirFiber 24 GHz K-Band Radios

2 Guidelines

In initial POC for IPT use over Ubiquiti AirFiber technology, PTP was offset too far from master to provide reliable PTP Lock and DECT Sync.

-Use of dedicated PTP leader clocks on each end believed to be a viable solution to overcome.

Intended end use at remote location will have limited connectivity, ideally just the IPT connected to the AirFiber Remote Unit.

3 Success Validation

To be successful, a single IPT (at a minimum) must connect and provide reliable PTP and DECT Sync and allow a FreeSpeak II 1.9GHz beltpack to successfully connect, transmit and receive audio, and freely roam from the main RF zones into the RF zone provided by the remote antenna.

4 Main Test Flow

4.1 System Under Test

PTP-2 SFP Master Clock ADVA OSA-5401 (GPS Lock Required via GNSS Antenna)

- Version: current to test date 4.12.2022
 - o IP: 192.168.0.3

Connected directly to IPT (LAN-3):

- Version 4.13.67.2
 - o AoIP Admin: 192.168.0.71
 - AoIP Audio: 192.168.0.72

Connected directly to Ubiquiti AirFiber REMOTE Unit

- Version: current to test date 4.12.2022
 - IP: 192.168.0.202

Connected via 24 GHz K-Band to Ubiquiti MASTER Unit

- Version current to test date 4.12.2022
 - o IP: 192.168.0.201

Connected to Cisco SG350 Series Switch (Port 9 in this example)

- Version: Tesla 2.5.8.15
 - IGMP Snooping
 - o IGMP Querier
 - IPv4-Based ACL
 - DENY Source 192.168.0.2 EGRESS to Ubiquiti Master Port

E-IPA AoIP (AES67) Connected to Cisco SG350 (Port 5 in this example)

- Version: 6.98.63.0
 - o IP: 192.168.0.16
 - PTP Member-Only Mode
 - Using AES67 Profile
 - Announce Interval: +1 (2s)
- EHX Version: 12.2

PTP-2 SFP Master Clock ADVA OSA-5401 (GPS Lock Required via GNSS Antenna)

- Version: current to test date 4.12.2022
 - o IP: 192.160.2

See drawing on next page for reference



4.2 Required Equipment

- 1x computer with
 - Windows 10 (or equivalent capable of running required software)
 - o EHX Version 12.2 or newer
 - Web Browser access to devices for configuration
 - Recommended Software:
 - WireShark
 - PTP Trackhound
- 1x Eclipse Matrix
 - 1x E-IPA with suitable license
- 2x IP-Transceiver 1.9GHz
- 2x Ubiquiti AirFiber 24 GHz K-Band
- 2x SFP SyncPlugs (ADVA OSA-5401)

5. Steps for programming and testing the UUT Unit-Under-Test (UUT)

5.1 Network

- Cisco SG350 (or equivalent)
 - Create VLAN for use with AoIP Subnet 192.168.0.254/24 (VLAN ID 1920 for example)
 - Assign VLAN to E-IPA AoIP and Ubiquiti Master ports
 - \circ $\;$ Assign VLAN to PC Port, so that it can manage switch and see AoIP VLAN $\;$
 - Enable Multicast > IGMP Snooping for VLAN ID 1920
 - Enable Multicast > IGMP Querier for VLAN ID 1920
 - Connect E-IPA to switch and note port (5 in example)
 - Connect Ubiquiti Master Unit to switch and note port (9 in this example)
 - Create IPv4 ACL (Remote IPT in this example)
 - Create IPv4 ACE
 - Priority 2: Deny Source 192.168.0.2 to Destination ANY
 - \circ $\;$ Bind the ACL to Port 9 EGRESS with a default ALLOW ANY

5.2 PTP

Remote Clock - ADVA OSA 5401 SyncPlug (In this Example)

- Plug the first clock into the switch, this will be setup for the REMOTE Unit
 - SSH to the Default IP: 192.168.0.2
 - User: root
 - PW: ChgMeNOW
 - Set the IP Address
 - #configure interface mgmt+ptp1 ip-address ipv4 192.168.0.3/24
 - Set the Gateway
 - #configure interface mgmt+ptp1 default-gw ipv4 192.168.0.254
 - Set the VLAN ID
 - #configure interface mgmt+ptp1 vlan-id 1920
 - o Set the VLAN Priority
 - #configure interface mgmt+ptp1 vlan-pcp 7
 - configure clock I3-profiles
 - #configure clock I3-profiles master multicast no shutdown
 - #configure clock I3-profiles master multicast interface add ptp1
 - #configure clock I3-profiles profile aes67-media
 - #configure clock I3-profiles master type two-step
 - #configure clock I3-profiles master multicast rate announce ½ (4)
 - #configure clock I3-profiles master domain-number 0
 - Optional: change Priority1 xx (128 in this example)
 - Optional: change Priority2 xx
 - Annc Rate comes in at 1s, need to change to 1/2s # configure clock I3-profiles master multicast rate announce
 - Sync-Rate comes in at 128/s, need to change to 8/s
 - # configure clock I3-profiles master multicast rate sync _____
 - Save the configuration
 - #save-and-reconfig
 - Verify the configuration
 - #show running-config

Local Clock - ADVA OSA 5401 SyncPlug (In this Example)

- Plug the first clock into the switch, this will be setup for the REMOTE Unit
 - SSH to the Default IP: 192.168.0.2
 - User: root
 - PW: ChgMeNOW
 - Set the IP Address
 - #configure interface mgmt.+ptp1 ip-address ipv4 192.168.0.2/24
 - o Set the Gateway
 - #configure interface mgmt.+ptp1 default-gw ipv4 192.168.0.254
 - Set the VLAN ID
 - #configure interface mgmt.+ptp1 vlan-id 1920
 - o Set the VLAN Priority
 - #configure interface mgmt.+ptp1 vlan-pcp 7
 - configure clock I3-profiles
 - #configure clock I3-profiles master multicast no shutdown
 - #configure clock I3-profiles master multicast interface add ptp1
 - #configure clock l3-profiles profile aes67-media
 - #configure clock I3-profile master type two-step
 - #configure clock I3-profiles master multicast rate announce ½ (4)
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 - Optional: change Priority1 xx (128 in this example)
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 - Annc Rate comes in at 1s, need to change to 1/2s # configure clock I3-profiles master multicast rate announce _____
 - Sync-Rate comes in at 128/s, need to change to 8/s

configure clock I3-profiles master multicast rate sync _____

• Save the configuration

•

- #save-and-reconfig
- Verify the configuration
 - #show running-confi

5.3 Ubiquiti AirFiber

First Device (to be Master)

- Connect to the CONFIG port on the unit and power up (reset to default by holding reset for 5+ seconds as needed)
 - Log into unit via default IP <u>https://192.168.1.20</u>
 - User: ubnt
 - Password: ubnt
 - Set Device IP: Settings > Network
 - Set IP Address: 192.168.0.201
 - Set Netmask: 255.255.255.0
 - Set Gateway: 192.168.0.254
 - Data Port Ethernet Settings
 - Disable Multicast Filtering
 - Save Changes
 - Log into new device IP
 - User: ubnt
 - Password: ubnt
 - Set Device to Master: Settings > Wireless
 - Wireless Mode: Master
 - Duplex: Full Duplex
 - Strict Timing: ON
 - Frequency Settings:
 - TX: 24.1 GHz
 - RX: 24.2 GHz
 - Save Changes

Second Device (to be Slave)

- Connect to the CONFIG port on the unit and power up (reset to default by holding reset for 5+ seconds as needed)
 - Log into unit via default IP <u>https://192.168.1.20</u>
 - User: ubnt
 - Password: ubnt
 - Set Device IP: Settings > Network
 - Set IP Address: 192.168.0.202
 - Set Netmask: 255.255.255.0
 - Set Gateway: 192.168.0.254
 - Data Port Ethernet Settings
 - Disable Multicast Filtering
 - Save Changes
 - Log into new device IP
 - User: ubnt
 - Password: ubnt
 - Set Device to Master: Settings > Wireless
 - Wireless Mode: Slave
 - Duplex: Full Duplex
 - Strict Timing: ON
 - Frequency Settings:
 - TX: 24.2 GHz
 - RX: 24.1 GHz
 - Save Changes

Mount/Place radios

Verifying Link

- The 2 devices use the LINK NAME to register the slave to the master.
 - This can be modified for multiple systems or custom names
 - Settings > System
 - Device > Device Name
- Log into the Master Unit
 - o In Dashboard, monitoring BEACONNING, REGISTRATION, and LINK STATUS
 - Under Signal Strength, you will see recommended "IDEAL POWER" shown
 - Go to Settings > Wireless
 - Output Power: enter "IDEAL POWER"
 - Save Changes

For more in-depth setup and verification of Ubiquiti AirFiber units, please consult Ubiquiti Manuals or support.

5.4 EHX Setup

- EHX > Hardware > Cards and Ports
 - Configure E-IPA
 - AoIP IP Address: 192.168.0.16 (in this example)
 - Protocol Settings
 - PTP Follower Mode: Enabled
 - Profile: AES67
 - Announce Interval: +1 (2s)
 - Add Ports for Wireless Beltpack
 - Assign Beltpack Roles
 - o Configure IPT
 - AoIP Admin IP Address: 192.168.0.71/24/.254
 - AoIP Audio IP Address: 192.168.0.72/24/.254
 - Add to EHX Transceivers
 - Register Beltpacks
 - Apply Map to Matrix

If additional support is needed for EHX Setup, please contact <u>Support@clearcom.com</u> or the assigned AE to your project.

6 System Setup

- Setup the system as per below



7 Mandatory Step

- Using PTP Trackhound and EHX Monitoring:
 - verify the E-IPA card is locked to PTP-GM-1 and shows good status.

Layout	Cards and Ports	Panels	Partylines	Crosspoint Map	Monitoring×	Transceivers	Beltpacks	Event Log	Wireless Status						÷
Search (s	supports RegEx)		,P Group By:	Matrix Type	Priority Fi	Iters: Current Mal	trix 🕥 🕴	Only Errors 🔵	Show Ignored	Ignore Missing: Panels 🕥	Beltpacks 🕥	Transceivers 🕥			> III
Ethen	net Ethernet Primary Online Clear-Com NAB 2022 IS ceivers											E-IPA-HX C Description: AoIP: PTP Status: PTP:	Slot 3 Slot 3 Instead Role: Master ID: Local ID: Master Priority: Local ID: Master Priority: Local Scientific	Slave 64.c3.07.ff.fc.fb.s4.27 00.0c.98.ff.fc.02.f9.a8 128	
E-28ZY	RPN 0:Offline (P901: No Data Connex Clear-Com NAB 2022	tion	RPN 1: 29YY3338: No E Clear-Com	Offline Data Connection NAB 2022	F 52 Clear	8PN 2:FSII-19 950385: Good r-Com NAB 2022		RPN 3:F 48XY8466: No D Clear-Com	SII-19 ata Connection NAB 2022			Additional Details:	Offset from Master(ns): Mean Path Delay(ns): License:	-2 5273 Volid	4
	Master Config Slot P2 Clear-Com NAB 2022		MVX-A Slo Clear-Com	16 Card ot 1 1 NAB 2022	E	-DANTE Card Slot 2 r-Corn NA8 2022		E-IPA-H: Slot Clear-Com	X Card t 3 NAB 2022	E-IPA-HX Card Slot 4 Clear-Corn NA8 2022			Wireless beltpack ports: Network: Rear Connection: State:	OK Admin LAN 1 Online	

 \circ $\;$ Verify the "Local" IPT is locked to PTP-GM-1 and shows good status.

Layout Transceivers X Monitoring X PTP Status Wireless Status	
Search (supports RegEx) P Group By: Matrix Type Priority Filters: Current Matrix Doly Errors	🕥 Show Ignored 🕦 Ignore Missing: Panels 🕦 Beltpacks 🌑 Transceivers 🌑
Alarms Fan Fail 2 Alarm Off Centrom NAB 2022 Centrom Com NAB 2022 Centrom NAB 202 Centrom NAB	All Power 2 Alarm Description: 29/1338: Good Description: 29/1388: Good Des
Internal Power 1 Alarm OH Clear-Com NAB 2022 Clear-Com NAB 2022 Clear-Com NAB 2022	n Fail T Alarn Dela Connection: Connection
✓ Transceivers	PTP: Role: Slave Master ID: 84.48.07.66.66.34.27
BPN DCElline BPN 1550-15 BPN 2550-19 F-22PTV0F1 Nc bate convection Clear Com NAB 2022 Clear Com NAB 2022 Clear Com NAB 2022	99 3 55 15 10 00 - 00 - 00 - 00 - 00 - 00 - 00 - 0
✓ Beltpack	Mean Path Delay(ns): SU64
Offline Beltpack 24091 FSII-19 Beltpack 01865 Offline Beltpack 525084 Offline 601 A1 Offline	e Beltpack 525058 Offline Beltpack 525034 Network: AoIP Admin Offline Offline Deltpack 525034 DHCP: False

- \circ $\;$ Verify the Remote IPT is locked to PTP-GM-2 and shows good status.
- Verify the IPT shows good PTP status and DECT Sync status.

Layout	Cards and Ports	Panels	Partylines	Crosspoint Map	Monitoring ×	Transceivers	Beltpacks	Event Log	Wireless Status					
Search (s	supports RegEx)		P Group By	r Matrix Type	Priority Fi	iters: Current Mat	rix 🕕 O	nly Errors 🕥	Show Ignored 🕥	Ignore Missing: Panels 🕥 Beltpacks 🕥	Transceivers			≫≣
✓ Ethen	net Ethernet Primary Online										RPN 2:FSII	- 19 52Y50385: Good		_ î
	Clear-Com NAB 2022										Visible (mDNS): Data Connection: AoIP:			
✓ Transi	ceivers										PTP Status: DECT sync: Transceiver Power	Locked Locked		
E-28ZY	RPN 0:Offline (P901: No Data Connec Clear-Com NAB 2022	ction	RPN 29YY3338: No Clear-Co	1:Offline Data Connection m NA8 2022	S2 Clea	RPN 2:FSII-19 ?Y50385: Good r-Com NAB 2022	·	RPN 3:F 48XY8466: No D Clear-Com I	SII-19 ata Connection NAB 2022		PTP:	Role: Master ID: Local ID: Master Priority:	Slave 84-c8-07-ff-fe-fb-a4-31 00-0e-98-ff-fe-05-45-2a 128 	
Y Hards	ware Cards											Local Priority: Offset from Master(n Mean Path Delay(ns):	254 s): 16 1418	
	Master Config Slot P2 Elear-Com NAB 2022		MVX- S Clear-Co	-A16 Card ilot 1 m NAB 2022	E	-DANTE Card Slot 2 r-Com NAB 2022		E-IPA-H Slot Clear-Com I	X Card : 3 NAB 2022	E-IPA-HX Card Slot 4 Clear-Com NAB 2022	Additional Details:	mDNS Name: CC- Network: Ao DHCP: Fal	-TCVR-52Y50385 IP Admin	

- Perform a talk test between a local device and a remote beltpack
- Perform a roaming test using a beltpack to roam between a local IPT and the Remote IPT

8 Additional Steps

-Test with IVC Connected Panel – verify audio and data - Confidence in application based on IP-Transceiver POC

-Test with AoIP Connected panel – verify audio and data -Confidence in application based on IP-Transceiver POC

-Test with IP-Transceiver – verify DECT and audio -Completed 4.6.2022 -EHX 12.2 -E-IPA 6.98.63.0 **This test confirmed FreeSpeak coverage at the remote transceiver while showing seamless roaming between the locally connected FreeSpeak Transceiver and the Remote Transceiver.